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Patentanmeldung Nr. Patent application No. Demande de brevet n°

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Der Präsident des Europäischen Patentamts;
Im Auftrag

For the President of the European Patent Office

Le Président de l'Office européen des brevets
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Blatt 2 der Bescheinigung
Sheet 2 of the certificate
Page 2 de l'attestation

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D E S C R I P T I O N

Managing Workload within Workflow-Management-Systems

1 Background of the Invention

1.1 Field of the Invention

The present invention relates to the area of performance and workload management within a Workflow-Management-System (WFMS).

1.2 Description and Disadvantages of Prior Art

A new area of technology with increasing importance is the domain of Workflow-Management-Systems (WFMS). WFMS support the modeling and execution of business processes. Business processes executed within a WFMS environment control which piece of work of a network of pieces of work will be performed by whom and which resources are exploited for this work. The individual pieces of work might be distributed across a multitude of different computer systems connected by some type of network.

The product "IBM MQSeries Workflow" represents such a typical modern, sophisticated, and powerful workflow management system. It supports the modeling of business processes as a network of activities. This network of activities, the process model, is constructed as a directed, acyclic, weighted, colored graph. The nodes of the graph represent the activities which are performed. The edges of the graph, the control connectors, describe the potential sequence of execution of the activities. Definition of the process graph is via the IBM MQSeries Workflow Definition Language (FDL) or the built-in graphical editor. The runtime component of the workflow manager interprets the process graph and distributes the execution of activities to the right person at the right

place, e. g. by assigning tasks to a work list according to the respective person, wherein said work list is stored as digital data within said workflow or process management computer system.

Business processes quite often consist of parts that are time critical, others are not. In particular time critical maybe those parts of a process that are carried out automatically; that means without any user intervention. The only method that has been proposed to control the processing behavior of a set of activities in terms of workload balancing is via the support of a workload management system (WLMS). Even if the WFMS may exploit the support of a WLMS to achieve its processing targets this is limited to certain processing environments only as only highly sophisticated operating systems like IBM's MVS system do provide this type of technology. Especially within a heterogeneous distributed processing environment, in which WFMS do operate, WLM-technology is missing on most of the involved systems.

1.3 Objective of the Invention

The invention is based on the objective to provide an approach for performance improved processing of time critical parts of a process model also operating within a heterogeneous and distributed environment.

2 Summary and Advantages of the Invention

The objectives of the invention are solved by the independent claims. Further advantageous arrangements and embodiments of the invention are set forth in the respective subclaims.

The invention relates to a computerized method of managing workload within a Workflow-Management-System (WFMS) said WFMS comprising a process-model, said process-model comprising one or more activities being the nodes of an arbitrary graph, and directed edges of said graph defining a potential control-flow within said process-model. The method comprises

a determination-step, wherein said process-model is analyzed if a priority-execution-indicator is assigned to said activity within said process-model. The method comprises a launching-step, wherein, in the affirmative case of said determination-step, the WFMS launches execution of said activity in the activity's execution-environment with an execution-priority specified according to said priority-execution-indicator.

By taking over workload management functions the WFMS becomes independent of the availability of a workload load management systems (WLMS). Thus the current teaching can be applied to almost all state of the art systems being of a significant advantage in a distributed and inhomogeneous processing environment being the typical application environments for WFMS. Thus no platform limitations for workload management do apply anymore. Incorporating the workload priorities already within a process model makes this definitions most transparent. On this level the specifications can be easily modified with no or only minor changes to the activity implementation. With increasing system complexity and increasing parallel execution of workload within in a system the advantages of the current invention do increase as more important activities will succeed within the competition for processing resources.

3 Brief Description of the Drawings

Figure 1 shows the example of the definition of a process model including priority specifications on the level of a performance sphere as well as on the activity level.

Figure 2 is a diagram reflecting the mapping of the canonical execution priority scheme within the process model to the particular operating system priorities available to execute the individual activities.

Figure 3 visualizes the basic structure of a WFMS being based on message queuing as communication paradigm reflecting the significant extend of benefit which can be achieved by also setting the priorities of the involved messages accordingly.

Figure 4 reflects the handling of messages between various WFMS components for the processing of an activity without applying the current teaching.

Figure 5 reflects changes of the handling of messages compared to the situation in Fig. 4, if the current teaching of assigning execution priorities to involved messages in the execution process of an activity is applied. Changes are indicated by an asterisk (*).

Figure 6 reflects changes of the handling of messages compared to the situation in Fig. 5, if the current teaching of performance spheres is included. Changes are indicated by an asterisk (*).

Figure 7 depicts a summarizing overview on the proposed method.

4 Description of the Preferred Embodiment

The current invention is illustrated based on IBM's MQSeries Workflow workflow management system. Of course any other WFMS could be used instead. Furthermore the current teaching applies also to any other type of system which offers WFMS functionalities not as a separate WFMS but within some other type of system.

Moreover if the current teaching is referring to a ▪message▪ this has to be understood as a general exchange of information via some sort of communication system not limited to messaging system in specific.

4.1 Introduction

The following is a short outline on the basic concepts of a workflow management system based on IBM's MQSeries Workflow WFMS as far as it is of importance for the current invention:

From an enterprise point of view the management of business processes is becoming increasingly important: **business processes** or **process** for short control which piece of work will be performed by whom and which resources are exploited for this work, i.e. a business process describes how an enterprise will achieve its business goals. A WFMS may support both, the modeling of business processes and their execution.

Modeling of a business process as a syntactical unit in a way that is directly supported by a software system is extremely desirable. Moreover, the software system can also work as an interpreter basically getting as input such a model: The model, called a **process model** or **workflow model**, can then be instantiated and the individual sequence of work steps depending on the context of the instantiation of the model can be determined. Such a model of a business process can be perceived as a template for a class of similar processes performed within an enterprise; it is a schema describing all possible execution variants of a particular kind of business process. An instance of such a model and its interpretation represents an individual process, i.e. a concrete, context dependent execution of a variant prescribed by the model. A WFMSs facilitates the management of business processes. It provides a means to describe models of business processes (build time) and it drives business processes based on an associated model (run time). The meta model of IBM's WFMS MQSeries Workflow, i.e. the syntactical elements provided for describing business process models, and the meaning and interpretation of these syntactical elements, is described next.

A process model is a complete representation of a process, comprising a process diagram and the settings that define the logic behind the components of the diagram. Important components of a MQSeries Workflow process model are:

- Processes
- Activities
- Blocks
- Control Flows
- Connectors
- Data Containers
- Data Structures
- Conditions
- Programs
- Staff

Not all of these elements will be described below.

Activities are the fundamental elements of the meta model. An activity represents a business action that is from a certain perspective a semantic entity of its own.

A MQSeries Workflow process model consists of the following types of activities:
Program activity: Has a program assigned to perform it. The program is invoked when the activity is started. In a fully automated workflow, the program performs the activity without human intervention. Otherwise, the user must start the activity by selecting it from a runtime work list. Output from the program can be used in the exit condition for the program activity and for the transition conditions to other activities.
Process activity: Has a (sub-)process assigned to perform it. The process is invoked when the activity is started. A process activity represents a way to reuse a set of activities that are common to different processes. Output from the process, can be used in the exit condition for the

process activity and for the transition conditions to other activities.

The flow of control, i.e. the control flow through a running process determines the sequence in which activities are executed. The MQSeries Workflow workflow manager navigates a path through the process that is determined by the evaluation to TRUE of start conditions, exit conditions, and transition conditions.

The results that are in general produced by the work represented by an activity is put into an output container, which is associated with each activity. Since an activity will in general require to access output containers of other activities, each activity is associated in addition with an input container too.

Connectors link activities in a process model. Using connectors, one defines the sequence of activities and the transmission of data between activities. Since activities might not be executed arbitrarily they are bound together via control connectors. A control connector might be perceived as a directed edge between two activities; the activity at the connector's end point cannot start before the activity at the start point of the connector has finished (successfully). Control connectors model thus the potential flow of control within a business process model. Default connectors specify where control should flow when the transition condition of no other control connector leaving an activity evaluates to TRUE. Default connectors enable the workflow model to cope with exceptional events. Data connectors specify the flow of data in a workflow model. A data connector originates from an activity or a block, and has an activity or a block as its target. One can specify that output data is to go to one target or to multiple targets. A target can have more than one incoming data connector.

Process definition includes modeling of activities, control connectors between the activities, input/output container, and data connectors. A process is represented as a directed acyclic graph with the activities as nodes and the control/data connectors as the edges of the graph. The graph is manipulated via a built-in graphic editor. The data containers are specified as named data structures. These data structures themselves are specified via the DataStructureDefinition facility. Program activities are implemented through programs. The programs are registered via the Program Definition facility. Blocks contain the same constructs as processes, such as activities, control connectors etc. They are however not named and have their own exit condition. If the exit condition is not met, the block is started again. The block thus implements a Do Until construct. Process activities are implemented as processes. These subprocesses are defined separately as regular, named processes with all its usual properties. Process activities offer great flexibility for process definition. It not only allows to construct a process through permanent refinement of activities into program and process activities (top-down), but also to build a process out of a set of existing processes (bottom-up).

All programs which implement program activities are defined via the Program Registration Facility. Registered for each program is the name of the program, its location, and the invocation string. The invocation string consists of the program name and the command string passed to the program.

4.2 The Prioritization Approach Within WFMS

Business processes are made up of a set of activities. Business processes quite often consist of parts, for instance individual activities or collections thereof, that are time critical while others are not.

For instance a group of activities can be perceived as a set of services that are related from a business point of view,

i.e. a unit of work that must jointly fulfill a performance goal. For example, a collection of application steps to be performed by a clerk while a customer is waiting for a response.
Also parts of a process that are carried out automatically, that means without any user intervention, are such candidates.
Other candidates that are time critical are atomic spheres and processes that implement message broker functionality. Atomic spheres are a collection of transactional workitems, i.e. activities within the process model, with a common commit scope and thus representing a global transaction. For the purpose to define such atomic spheres the process model can be analyzed to identify subgraphs having the property that such a subgraph does not contain not necessarily different activities which are connected by a path of control connectors which contains at least one activity not contained in said atomic-sphere.

The derivation of such collections of time critical activities is difficult and cumbersome in non-trivial cases because of the lack of information about the relation of application functions: This information is mostly hidden in special application programs, or the relation changes because of new requirements, because applications are integrated in new ways for interoperability etc.. The larger the number of different applications participating in the workload management the more complex the situation becomes. The situation is even worse in case of integration of different application, especially if the applications originally have not be designed to work together.

As it is typically the case in heterogeneous distributed processing environment, WFMS cannot rely on the support of an underlying WLMS for managing the processing targets of its managed activities. Current state of the art WFMS neither do

have the information nor the capabilities which activities to favor with respect to others.

This patent application proposes the approach of assigning priority levels to activities already within the process model. Moreover it is suggested to enrich the process model with semantic relations of application functions as being collections of activities that should be pushed through the system in "optimal time", leading to the concept of performance spheres. Thus according to the current teaching priorities can be assigned on multiple levels: on the level of the whole process model, on the level of a new concept of performance spheres or on the level of individual activities; the later level overriding the settings of the preceding levels. At execution time the WFMS is responsive to these specifications allowing it to set the priority with which a particular activity or set of activities should be carried out. The proposed solution uses the facilities of the operating system and middleware, such as message queuing to control the performance of parts of a workflow, rather than a workload management system. As such it can deployed in all environments rather than being limited to certain platforms.

To identify the priority that should be assigned to an activity or a set of activities, a set of new properties are added to the meta model of the WFMS; i.e. the priority definitions are already included in the process model of a business process.

First a new keyword EXECUTION_PRIORITY is added to the specification of an activity. Valid entries are CRITICAL, HIGH, MEDIUM, and LOW (or any other conceivable enumeration). For consistency, the keyword EXECUTION_PRIORITY may also be attributed to the whole process model. The specification on the process model level serves as a default from which all activities inherit; that means if nothing is specified on the activity level the setting at the process level is used.

Second, a new section PERFORMANCE_SPHERE is added that allows to identify a sub-graph in the process model. The EXECUTION_PRIORITY allows to assign an execution priority to the sub-graph. Within a performance sphere the execution priority defined for the sphere becomes the default execution priority for the individual activities. Again the priority specifications on the activity level may override the specifications on the performance sphere level.

The specification shown in Fig. 1 shows the definition of a performance sphere. The sphere contains two activities. Referring to Fig. 1 it shows the definition of a performance sphere (100) defining the default execution priority (101) for activities within the performance sphere. Moreover the definition of two activities (110) and (120) are visualized as part of above performance sphere (112, 113). Within the specifications of the activity (110) an explicit execution priority (111) is defined thus overriding the corresponding default execution priority (101) on the level of the encompassing performance sphere. In contrast to that the specification of the activity (120) comprises no extra priority definition, therefore it will be executed with the execution priority defined by its encompassing performance sphere (100).

According the current invention the WFMS will be responsive to the priority specifications when executing the process model at run-time. The invention suggest to let the WFMS balance its workload along the following dimensions:

1. by setting the execution priority of the activity implementation, and/or
2. by setting the execution priorities of the workflow system itself, and/or
3. by setting the priorities of the messages relating to the processing of said activity for communication

within said WFMS and/or with said activity according to the activity's execution priority.

4.2.1 Setting the Priority of the Activity Implementation

State of the art operating systems assign a priority to each execution unit of the operating system, such as processes and threads, also called light-weight processes. To simplify the description we use the term **process** in the wider sense of comprising **heavyweight processes**, i.e. processes in the narrow sense, **light-weight processes**, i.e. threads, or other types of execution units. Based on the priority, more or less resources are made available to the operating system process. The priority is assigned to the operating system process entity when the process is created. The priority can be supplied by the creator of the operating system process; that means the starter of an executable can specify the priority of the operating system process that is created for the executable. The executable itself can change the priority of the operating system process it is running in at any time (this mechanism will be used to allow the already executing WFMS to reset its own execution priority - see below).

If the activity implementation is an executable, the WFMS can assign a particular operating system priority under which the executable can be carried out. This way the program executor can give the executable a particular operating system priority based on the execution priority assigned to the activity. Since every operating system has a different priority scheme, the execution priorities need to be mapped to the priorities of the specific operating system used to execute the particular activity. Fig. 2 shows the mapping of the canonical execution priority scheme within the process model to the particular operating system priorities available to execute the individual activities. It is assumed that the operating system, anonymously called OS, supports a priority scheme with 16 levels, 0 being the lowest and 15 being the highest level; extension to other operating systems are

indicated. These control definitions have to be specified for each operating system for which executables are carried out as activity implementations. When such an activity is now carried out, the appropriate execution priority is mapped according to Fig. 2 to the appropriate operating system priority. This approach is of specific advantage for a WFMS executing in a distributed and heterogeneous processing environment.

Other mechanism for prioritization exist for other type of activity implementations, such as objects managed by an object server, or the sending out a message that is picked up by the activity implementation. Without deviating from the proposed teaching a corresponding mapping from the execution priority levels within the WFMS can be mapped onto the scheme use to control execution priority within the particular execution environment.

It should be noted that setting of the execution priority can either be performed by the workflow management system or the activity implementation or a combination of both. If for example the activity implementation is invoked via a message sent via a message queuing system, then the workflow management system sets the priority of the message that is sent and the activity implementation sets its execution priority based on the execution priority submitted in the message.

4.2.2 Setting the Workflow Management System Execution Priority

Complementary to changing the operating system priority for the executables, a further dimension of the current invention is that the workflow system itself modifies its own operating system priority when carrying out an activity implementation or when processing a performance sphere. Mapping the execution priority to the operating system priority can be

done either with the one shown in Fig. 2 or with a similar one dedicated to the WFMS itself.

4.2.3 Setting the Message Priority

If the WFMS uses a communication system, like for instance message queuing, for communication between the different components of the WFMS and the communication systems provides some type of priority assignable to the communication units (called "messages" in the current description) the current invention suggests also to dynamically alter the priorities of those messages in accordance to the priorities of the activities; i.e. it is suggested to set the priorities of the messages relating to the processing of a certain activity for communication within said WFMS and/or between different WFMS and/or with said activity according to the activity's execution priority. The mapping of the execution priority to the message priority is also done via a mapping similar to the one shown in Fig. 2. For instance Fig. 2 could be extended by a further column relating to the priority levels available with the communication system.

Above mentioned possibilities to influence priority based execution, i.e. setting the execution priority of the workflow system itself and setting execution priority of the messages, are independent from one another and thus can be exploited separately or in combination.

Fig. 3 shows the basic structure of a WFMS that being based on message queuing as communication paradigm (the invention of course also applies to any other model of communication). Fig. 3 reflects various WFMS components exchanging messages in their process of cooperation to perform execution of process models and thus gives an impression of the achievable advantages by also setting the message priorities according the proposed teaching.

The **navigator** (301) performs the processing of the business processes which includes navigating from activity to activity, determining the set of users to perform the activity, and to request from the program executor the execution of the activity implementations. The **program executor** (302) invokes the activity implementations using implementation type specific mechanisms, operating system functions or message queuing, for example. The **administration service** (303) controls the operation of the WFMS; the **client** (304) provides the application programming interface. As shown, communication between the components is performed via message queuing in this example. In fact, there is no need to use message queuing, but any priority based communication mechanism will be sufficient to realize the current teaching.

From a logical point of view using message queuing one can construct a ▪communications bus▪ for the WFMS similar to the hardware bus of a personal computer. When a component needs services from another component, it sends a message using the queue name of the appropriate component. The targeted component receives the message as soon as it is ready for processing. Correlation identifiers are associated with messages, if a response is expected from a component.

It is immaterial where each of the components resides, whether it is the same processor or a different processor. Using message queuing as the only communication bus, components can be placed wherever they are suited best.

4.2.4 Processing

The standard way of navigating through the process graph and invoking activity implementations involves a set of messages being exchanged between the navigator and the program executor.

Fig. 4 refers to the handling of messages between various WFMS components for the processing of an activity without

applying the current teaching. The example is based on an automatic activity, that means an activity whose activity implementation is automatically started when the activity has been selected during process navigation. The messages sent to the program executor are processed by the program executor on a first come, first served basis.

When a single activity is defined with an execution priority, the flow specified in Fig. 4 changes to the flow as shown in Fig. 5, if the current teaching of assigning execution priorities to involved messages in the execution process of an activity is applied. Changes are indicated by an asterisk. The message is now sent to the program executor with an appropriate message priority. This causes the message to be processed in priority sequence by the message system as well as by the WFMS. The higher the execution priority, the earlier the activity implementation is invoked. The activity implementation is launched with the appropriate execution priority; in the case of an executable this is the corresponding operating system priority.

Within a performance sphere, the completion message is also assigned the message priority and the navigator sets its operating system priority that corresponds to the execution priority of the performance sphere. These changes the processing of Fig. 5 to the one in Fig. 6. Changes are indicated by an asterisk.

4.3 Summarizing Overview

Fig. 7 depicts a summarizing overview on the proposed method.

Referring to Fig. 7 the step (701) reflects that the process model is analyzed for priority execution specifications. As depicted by step(702) it depends on the level priority execution specifications were found, which of the determined priority execution indicators is assigned as execution priority. Priority specifications on the activity level

precede that on the performance sphere level; and the priority specification determined on the performance sphere level precedes that on the process model level. The current invention suggests to influence processing of workload by the WFMS along three dimensions: said three dimensions are started with the steps (703), (704) and (705). To finally launch, as a first dimension, processing of a particular activity with an execution priority, first within step (703) the execution environment of that particular activity is determined. Once the execution environment is known that canonical execution priority value is mapped in step (708) onto the corresponding value according to that execution environment. This value is finally used in step (709) passing it to the execution environment when launching that particular activity. To set, as a second dimension, the execution priority of the WFMS-internal processing to a particular execution priority, first within step (704) the execution environment of that WFMS is determined. Once then execution environment is known that canonical execution priority value is mapped in step (708) onto the corresponding value according to that execution environment. This value is finally used in step (706) to reset the WFMS-internal execution priority of that WFMS. To set, as a third dimension, the priority of a message exchanged via the communication system, first within step (705) the used communication system is determined. Based on that knowledge canonical execution priority value is mapped in step (708) onto the corresponding value according to that communication system. This value is finally used in step (707) to set the priority of a message communicated via the particular communication system.

5 Advantages of the Invention

By taking over workload management functions the WFMS become independent of the availability of a workload load management systems (WLMS). Thus the current teaching can be applied to almost all state of the art systems being of a significant

advantage in a distributed and heterogeneous processing environment being the typical application environments for WFMS. Thus no platform limitations for workload management do apply anymore. Incorporating the workload priorities already within a process model makes this definitions most transparent. On this level the specifications can be easily modified with no or only minor changes to the activity implementation. With increasing system complexity and increasing parallel execution of workload within in a system the advantages of the current invention will increase as more important activities will succeed within the competition for processing resources.

Moreover, the workload processing is not limited to the activity only. The proposed teaching allows in addition the WFMS itself to participate within the workload processing. The invention teaches that those portions of the WFMS which directly support the processing of a certain process model are also prioritized in accordance to the activity's priority leading in a further increase of the efficiency of the workload processing.

As a further advantage the invention is also able to integrate the communication aspects into the workload processing. Prioritizing messages related to the processing of an activity in accordance to the activity's execution priority offers further workload management control. In distributed environments as addressed by WFMS the communication effort can be significant and thus providing workload control over this aspect can effectively contribute to the overall success of workload management. Moreover this teaching is also applicable to the case where different WFMS instances are being executed in a distributed environment cooperating via messages. Thus the teaching allows the workload processing to span multiple machines in a distributed processing environment.

By allowing to assign execution priority specifications on various levels: on the level of the process model as a whole, and/or on the level of the new performance sphere concept an/or finally for individual activities a business process represented by a process model can be managed on all levels of granularity.

Assigning execution priority specifications can be done without knowing the different notions of priority levels of the individual potential execution environments. The priority levels offered according to the current teaching can be viewed as a kind of canonical priority levels which will be mapped transparently by the WFMS using translation tables onto priority notions applying to the particular execution environment.

In addition the current invention teaches a WFMS to launch execution of an activity in a direct and an indirect manner. In the direct approach the WFMS is calling the activity with the determined execution priority. In the indirect approach the WFMS launches execution of an activity indirectly by sending said activity a message set to the determined execution priority and said activity is responsive by setting its execution priority accordingly. Such a teaching offers important advantages in situations, wherein due to technical reasons (especially within distributed environments) a WFMS is not enabled to directly call an activity implementation (because for instance it is located remote to the launching WFMS).

C L A I M S

1. A computerized method of managing workload within a Workflow-Management-System (WFMS) said method being executable by said WFMS on at least one computer system,

said WFMS comprising a process-model, said process-model comprising one or more activities being the nodes of an arbitrary graph, and directed edges of said graph defining a potential control-flow within said process-model, and

said method comprising a determination-step, wherein said process-model is analyzed if a priority-execution-indicator is assigned to said activity within said process-model, and

said method comprising a launching-step, wherein, in the affirmative case, said WFMS launches execution of said activity in said activity's execution-environment with an execution-priority specified according to said priority-execution-indicator.

2. A method of managing workload within a WFMS according to claim 1,

wherein, in the affirmative case of said determination-step, said WFMS sets its own execution-priority for the WFMS-internal processing relating to said activity with respect to the WFMS's execution-environment to the execution-priority specified according to said priority-execution-indicator.

3. A method of managing workload within a WFMS according to claim 2,

wherein, in the affirmative case of said determination-step, one or more messages for communication within said WFMS and/or between different WFMS and/or with said activity via a communication-system said message relating to the processing of said activity are set to the execution-priority specified according to said priority-execution-indicator.

4. A method of managing workload within a WFMS according to claim 1,

wherein in said determination-step said process-model is analyzed for a priority-execution-specification associated with said activity, and, in the affirmative case, assigning the priority-execution-indicator of said priority-execution-specification of said activity to said activity, and/or

without a priority-execution-specification of said activity, wherein in said determination-step said process-model is analyzed for a priority-execution-specification of a performance-sphere comprising said activity, said performance-sphere comprising a sub-graph of said process-model associating a process-execution-indicator to activities within said performance-sphere, and, in the affirmative case, assigning the priority-execution-indicator of said priority-execution-specification of said performance-sphere to said activity, and/or

without a priority-execution-specification of said performance-sphere, wherein in said determination-step said process-model is analyzed for a priority-execution-specification associated with said process-model, and, in the affirmative case, assigning

the priority-execution-indicator of said priority-execution-specification of said process-model to said activity.

5. A method of managing workload within a WFMS according to claim 3,

wherein in said launching-step said priority-execution-indicator is mapped to a value in accordance to said activity's specific execution-environment, and/or

wherein in said launching-step said priority-execution-indicator is mapped to a value in accordance to said WFMS's specific execution-environment, and/or

wherein in said launching-step said priority-execution-indicator is mapped to a value in accordance to said communication-system.

6. A method of managing workload within a WFMS according to claim 3,

wherein in said launching-step said WFMS launches execution of said activity directly by calling said activity with said execution-priority; and/or

wherein in said launching-step said WFMS launches execution of said activity indirectly by sending said activity a message set to said execution-priority and said activity being responsive by setting its execution priority accordingly.

7. A system comprising means adapted for carrying out the steps of the method according to anyone of the preceding claims 1 to 6.

8. A data processing program for execution in a data processing system comprising software code portions for performing a method according to anyone of the preceding claims 1 to 6.

9. A computer program product stored on a computer usable medium, comprising computer readable program means for causing a computer to perform a method according to anyone of the preceding claims 1 to 6.

```
PERFORMANCE_SPHERE QueryCustomerAccount
  EXECUTION_PRIORITY=HIGH
END QueryCustomerAccount

PROGRAM_ACTIVITY GetCustomerInfo
  EXECUTION_PRIORITY=CRITICAL
  RELATED_PERFORMANCE_SPHERE QueryCustomerAccount
END GetCustomerInfo

PROGRAM_ACTIVITY GetAccountBalance
  RELATED_PERFORMANCE_SPHERE QueryCustomerAccount
END GetAccountBalance
```

FIG. 1

EXECUTION PRIORITY	OS	AIX	OS/2
CRITICAL	14	...	...
HIGH	10	...	
MEDIUM	7		
LOW	4		

FIG. 2

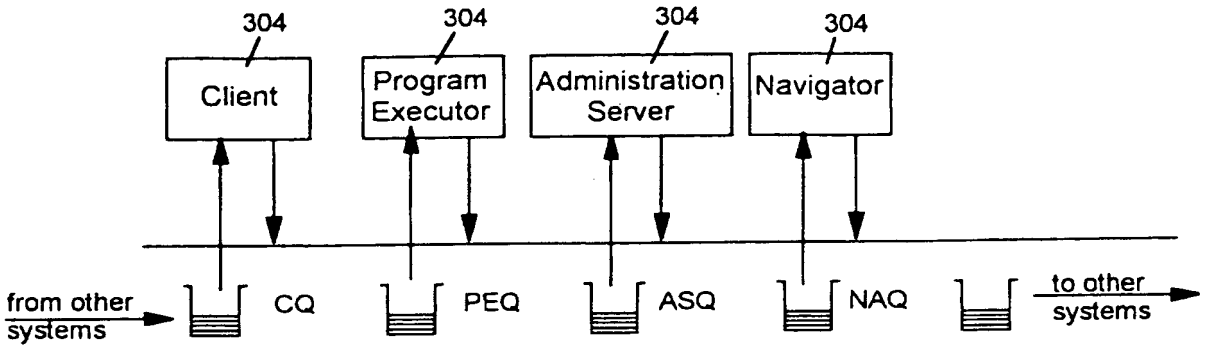

FIG. 3

Navigator locates activity

Navigator inserts request message into program executor queue

Program executor reads message from queue

Program executor launches the activity implementation

Program executor waits for completion

Program executor inserts completion message into navigator input queue

Navigator reads completion message

Navigator continues navigation

FIG. 4

Navigator locates activity

* Navigator sets message priority according to the execution priority of the activity

Navigator inserts request message into program executor queue

Program executor reads message from queue
* according to message priority

Program executor sets its operating system priority according to the execution priority of the activity

Program executor launches the activity implementation
* with appropriate execution priority

Program executor waits for completion

* Program executor resets its operating system priority to default

Program executor inserts completion message into navigator input queue

Navigator reads completion message

Navigator continues navigation

FIG. 5

Navigator locates activity

* Navigator sets message priority according to the execution priority of the activity

Navigator inserts request message into program executor queue

Program executor reads message from queue according to message priority

Program executor sets its operating system priority according to execution priority of the activity

Program executor launches the activity implementation with appropriate execution priority

Program executor waits for completion

Program executor resets operating system priority to default

* Program executor sets message priority according to the execution priority of the performance sphere

Program executor inserts completion message into navigator input queue

Navigator reads completion message

* Navigator sets operating system priority according to execution priority of performance sphere

Navigator continues navigation

FIG. 6

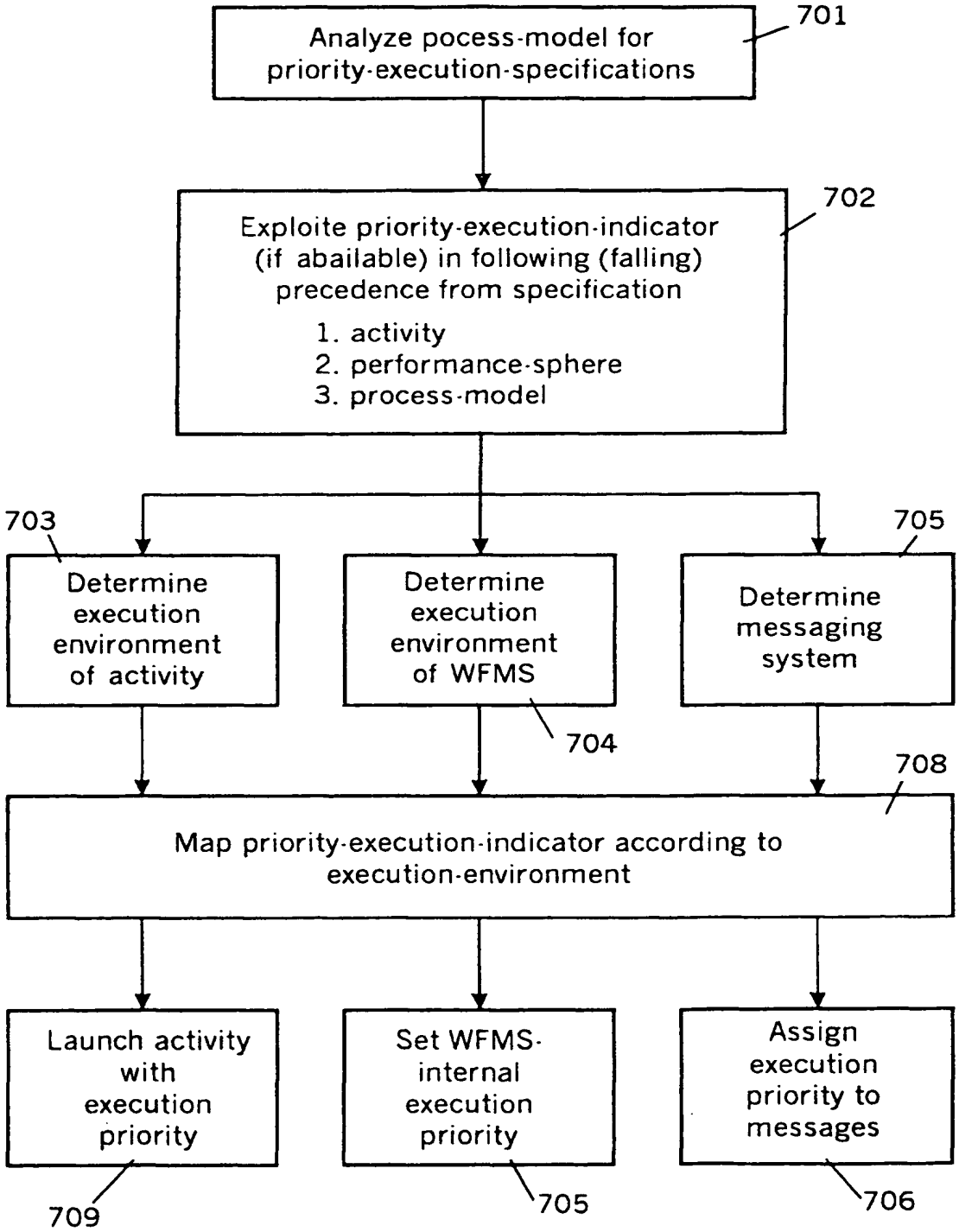

FIG. 7

A B S T R A C T

The invention relates to a computerized method of managing workload within a Workflow-Management-System (WFMS) said WFMS comprising a process-model, said process-model comprising one or more activities being the nodes of an arbitrary graph, and directed edges of said graph defining a potential control-flow within said process-model. The method comprises a determination-step, wherein said process-model is analyzed if a priority-execution-indicator is assigned to said activity within said process-model. The method comprises a launching-step, wherein, in the affirmative case of said determination-step, the WFMS launches execution of said activity in the activity's execution-environment with an execution-priority specified according to said priority-execution-indicator. Moreover the invention suggests that said WFMS sets its own execution-priority for the WFMS-internal processing relating to said activity with respect to the WFMS's execution-environment to the execution-priority specified according to said priority-execution-indicator. Finally the invention teaches that messages for communication within said WFMS and/or between different WFMS and/or with said activity via a communication-system, said message relating to the processing of said activity, are set to the execution-priority specified according to said priority-execution-indicator.